

Triggerfish bite – a little-known marine hazard

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Injury to divers in tropical and subtropical waters from bites by triggerfishes have not been documented in the medical literature or in books and papers dealing with dangerous marine animals. Reports are given of five cases of divers sustaining bites from triggerfishes. The most dangerous of the triggerfishes are the tropical Indo-Pacific species *Pseudobalistes fuscus* and *Balistoides viridescens*. Ordinarily these two fishes are very shy, but females guarding a nest can become extremely aggressive. Divers should not continue to swim toward a large triggerfish that does not move away upon their approach. Divers should also be warned not to feed triggerfishes by hand, as even small species are capable of inflicting bite wounds on the hands.

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Introduction

Most SCUBA divers are aware of the common hazards of the undersea environment, such as decompression sickness, air embolism, and ear and sinus trauma. They are also usually well-informed of the marine animals which are potentially dangerous. Certain jellyfishes and hydroids are capable of eliciting extremely painful stings. Warnings are given to avoid contact with the pedicellaria of some sea urchins, the venomous spines of crown-of-thorns starfishes, and those of a variety of fishes such as scorpionfishes, stingrays, rabbitfishes, and certain catfishes. Stings from cone shells and the bite of the blue-ringed octopus can be fatal. Foremost in the mind of all divers is the threat of being bitten by fishes, for this can happen under circumstances which even the most cautious person may be unable to avoid. The best-known fishes which bite humans without provocation are, of course, sharks, although only a few of the species are truly dangerous. Moray eels and barracudas are also feared, but the danger from them is greatly overstated.

The average diver is unaware that triggerfishes constitute a threat. Furthermore, books and scientific papers written on dangerous sea life, such as those of Phillips and Brady [1], Halstead [2], Neve [3], Edmonds [4], Helm [5], Banner [6], Iversen and Skinner [7], Greenberg and Greenberg [8], Vine [9], and Mandojana [10] have failed to mention this hazard.

The triggerfish family Balistidae consists of 11 genera with 33 species of fishes of tropical and subtropical seas. These fishes are among the most highly evolved, being relatives of the filefishes (Monacanthidae), boxfishes (Ostraciidae), puffers (Tetraodontidae, well known in the medical world for possessing tetrodotoxin), and porcupinefishes

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(Diodontidae). Triggerfishes have some peculiar characteristics: their snouts are long and the eyes are high on the head; the skin is tough, consisting of nonoverlapping scales with an area of small bony tubercles in the centre of each; the pelvic fins have been replaced by a small bony knob at the end of the long pelvic bone; and the mouth is small, but the jaws are strong, each with eight long, protruding, and chisel-like teeth in an outer row, buttressed by an inner row of six teeth. There are two dorsal fins, the first of three spines. The common name 'triggerfish' is derived from the fish's ability to lock its stout first dorsal spine into an erect position with the small second spine. The latter is the 'trigger', for one can 'unlock' the first spine by depressing the second.

These fishes feed on a wide variety of marine life, especially on hard-shelled animals such as crabs, sea urchins, molluscs, and even coral, which they can quickly fragment with their powerful jaws and sharp teeth.

Ordinarily, triggerfishes are among the most wary in the sea. They are not fast swimmers, cruising by undulating the second dorsal and anal fins; they bring the caudal fin into action only when they need to move more quickly. They tend to retreat from an approaching diver, but if sorely pressed will seek refuge in a hole in the reef with a small entrance, where they wedge themselves in place inside by erecting the first dorsal fin and depressing the pelvic bone. One can catch such a triggerfish by hand by reaching in to push down the second dorsal spine, thereby releasing the fixed first spine, and pulling the fish out. Care must be taken to avoid getting fingers near the mouth, or one will surely be bitten.

Most marine fishes lay pelagic eggs which drift and develop in the open sea. Triggerfishes are among the few families which lay demersal eggs and practice parental care. Of those marine fishes which guard their nest of eggs, such as the damselfishes (Pomacentridae) and blennies (Blenniidae), it is generally the male which is the guarding parent. Although a number of authors have assumed that male triggerfishes carry out this protective role, Fricke has shown that it is the females [11]. These females are very aggressive to other fishes; many species of triggerfishes will exhibit aggression to a diver as well, but it generally takes the form of an overt rapid movement towards the intruder, quickly followed by a rapid retreat to the nest.

Two large species of triggerfishes, *Pseudobalistes fuscus* (Fig. 1), known as the Yellowspotted Triggerfish or Blue Triggerfish, and *Balistoides viridescens* (Fig. 2), with a common name of Titan Triggerfish undertake threat behavior which is not wholly bluff. These two fishes attain total lengths of about 55 and 75 cm respectively. Both are wide-ranging in the tropical and subtropical Indian and Pacific Oceans from the Red Sea and coast of East Africa to French Polynesia. A guarding female will rush at an advancing diver in a highly directional, determined manner, but will turn back if the diver is not too close. The recipient of such menacing behavior is not apt to continue swimming toward the fish. If, however, one does advance, the likelihood of the next rush of the triggerfish ending in an actual attack is increased.

The nests of these two large triggerfishes are usually in sand or sand-rubble substrata near reefs. The nest consists of a shallow crater, about 50–70 cm in diameter for *Pseudobalistes fuscus* and slightly larger for *Balistoides viridescens*. The crater is prepared by the female, which ejects water forcefully from the mouth to blow away the sand and removes stones and pieces of shell and coral with the jaws.

A third large Indo-Pacific triggerfish, *Pseudobalistes flavimarginatus*, intermediate in size to *P. fuscus* and *Balistoides viridescens*, has the same reproductive habits but is more

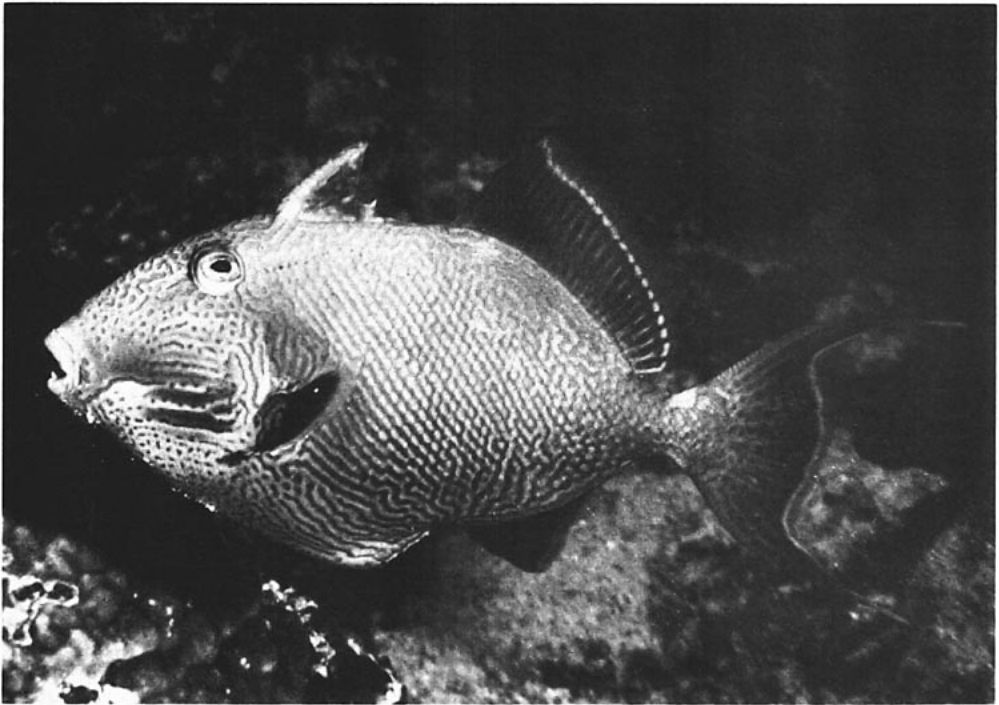


Fig. 1. Yellowspotted Triggerfish (*Pseudobalistes fuscus*), Maldives Islands (photo by J. Randall).

timid than the other two species. It has not been implicated in attacks upon divers.

In the Red Sea, the senior author has on several occasions been threatened by *Pseudobalistes fuscus*, but was always far enough from the nest to avoid a close encounter. Fricke [11] reported that two divers in the Gulf of Aqaba had to be hospitalized in Eilat, Israel due to serious bites on the legs, and several others, including himself, were 'badly bitten'.

Case report 1

In early March, 1979, while the senior author was diving with Dr. Gerald R. Allen and Roger C. Steene outside the reef at North Male Atoll, Republic of Maldives, each blundered into the proximity of a nest of a *Balistoides viridescens* without first seeing the guarding fish. The senior author's underwater camera housing was struck by the fish and knocked from his grasp. Dr. Allen, who was wearing trousers rather than tight-fitting wetsuit pants, had the bottom of his trousers seized and shaken by the fish. Mr. Steene was less fortunate, as he was bitten on the forearm, though not seriously because of strong protective clothing.

Case report 2

In late May, 1981, off the east side of Mactan Island, Cebu, Philippines, the senior author was diving alone on a coral reef when he felt something bite him on the calf of his right leg. Whirling instantly to see what it was, he kicked free of the grasp of a large *Balistoides viridescens* that he had not noticed before. He swam away from the attacking fish,

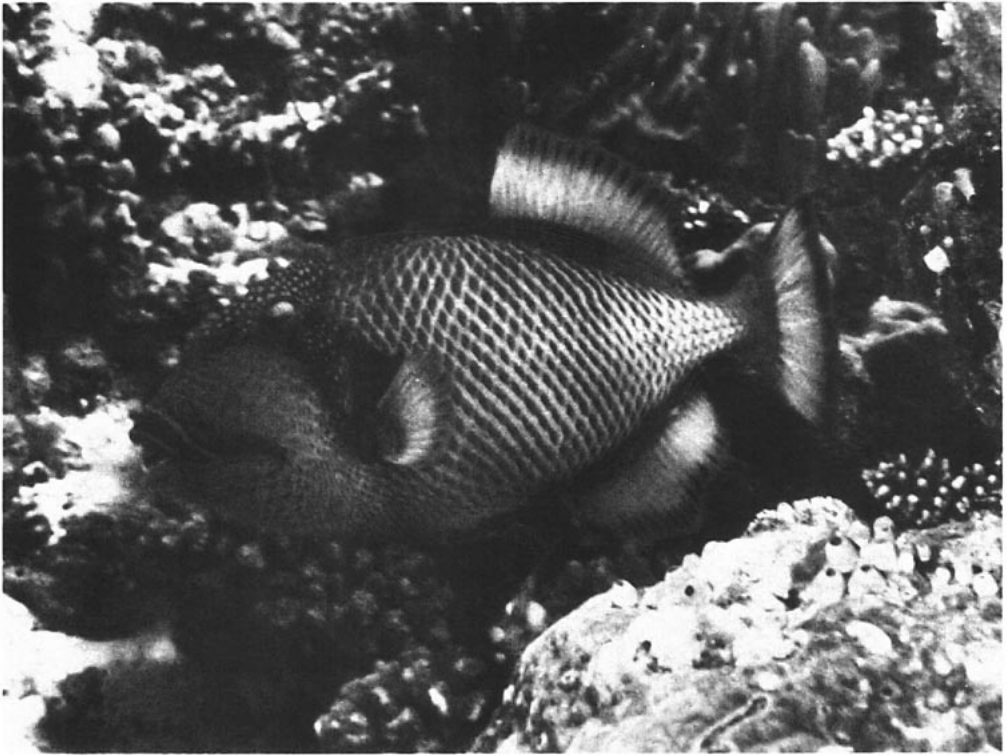


Fig.2. Titan Triggerfish (*Balistoides viridescens*), Maldives Islands (photo by J. Randall).

moving upward from the bottom at the same time. The triggerfish followed, repeatedly rushing at the diver, who warded it off with his swim fins. Only after nearly reaching the surface, approximately 30 m from the site of the initial attack, did the fish withdraw. Brief mention was made of this attack by Randall [12].

Case report 3

On October 21, 1987, the senior author was diving at Menjangan Island, a marine preserve off northwest Bali, when he encountered a large *Balistoides viridescens* at a distance of approximately 4 m guarding a nest in sand near the fringing reef at a depth of 7 m. The fish made a rapid movement in his direction, then turned back to the nest. A wide circuitous route was followed to avoid any further aggression from the fish. Later it was discovered that other divers who had unknowingly ventured too close had been attacked by the fish. One Indonesian with long black hair had his hair seized and pulled by the fish. Luckily, no wounds were inflicted.

Case report 4

On November 25, 1988, diving on the Great Barrier Reef about 20 miles northeast of Cairns, Queensland, Australia, a group of five divers were harassed by a *Balistoides viridescens* about 60 cm long. They encountered the fish at 10 m as they were returning to the vessel from a dive to a greater depth. The fish swam aggressively toward the divers, nipping them variously on the buttocks, thigh, and heel. It threatened the divers

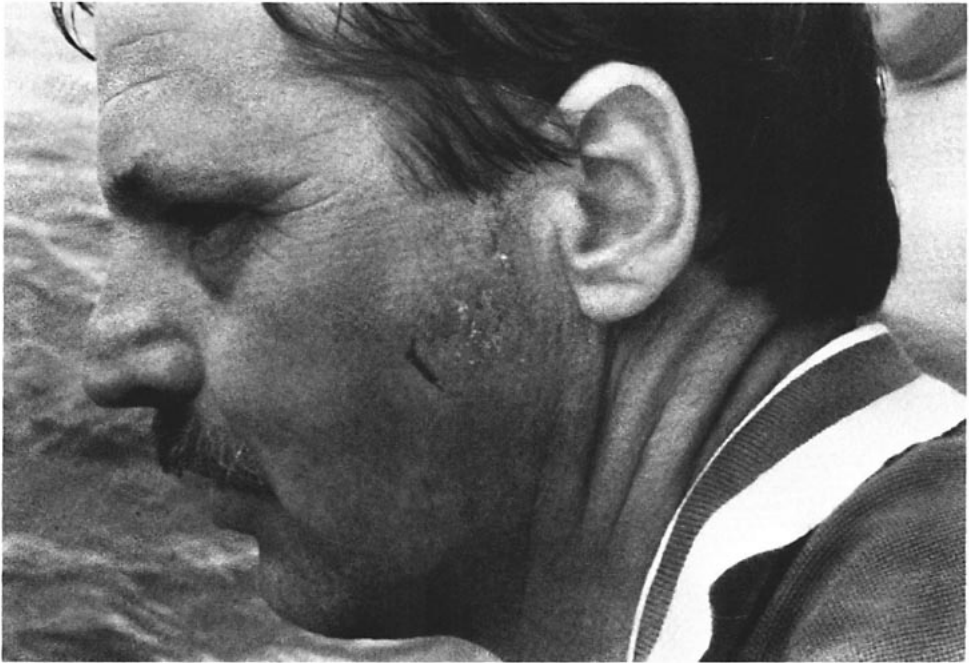


Fig. 3. Cheek wound of a diver inflicted by a Titan Triggerfish (*Balistoides viridescens*), Great Barrier Reef (photo by T. Millington).

continuously as they swam away from it toward the surface. The principal victim sustained several nips on the cheek anterior to the ears, and then a large bite over the parotid area (Fig. 3). After the initial bite, the fish continued to pull on the skin and soft tissue with a powerful suction. The diver had to deliver a strong blow to the fish before it would release.

Examination of the wound aboard the dive vessel by the junior author revealed a 3–4 cm laceration approximately 0.4 cm deep over the parotid area of the left cheek. There was marked swelling around the wound due to the suction by the fish. Several small abrasions were noted anterior to the ear due to the earlier nips.

The patient was started on cefuroxime 500 mg BID. The wound was cleansed with sterile water and cold compresses were used to alleviate the intense soft tissue swelling. Due to the probability of bacterial contamination, the wound was not sutured. When the patient returned to shore, he received appropriate tetanus antitoxin. The laceration healed without evidence of infection, with acceptable cosmetic results.

Case report 5

On June 1, 1989, at Bunaken Island, off Manado, Sulawesi (Celebes), Indonesia, the first of four divers, Reinhart Garang, was bitten on the forearm by a large *Balistoides viridescens* (estimated 7 kg). The compression of the bite was painful, but because of the protection of a wetsuit jacket, the skin was not penetrated by the teeth of the fish. The second diver, Pauline Fiene, who provided the written report of this encounter, was charged by the fish, but it turned away just in front of her. The third diver, Mr. Sukegawa, unaware of the danger, came too close and was charged by the fish which

struck his forehead with great force, leaving a large red lump. The last diver, Mike Severns, witnessed the attack on Sukegawa. Holding his camera housing before him, he enticed the fish to charge so that he could take its photograph. The divers noticed a depression in the sand with a pinkish mass at the bottom which constituted the nest. They observed a second smaller fish at the nest site which did not exhibit aggressive behavior. This fish was probably the male mate of the attacking female.

Case report 6

On June 2, 1989, Dr. Phillip S. Lobel was diving on a small artificial reef of concrete blocks he had established in 5 m off Jupiter Beach, Florida. The reef had been in the sea only six months and the marine growth on the blocks was sparse – mainly barnacles and hydroids. Three subadults of *Balistes capricus* (common name, Gray Triggerfish) about 18 cm in length were on the reef that day. This species occurs on both sides of the Atlantic; it reaches a total length of about 30 cm. The three fishes were surprisingly unafraid of Lobel, who photographed one of them (Fig. 4). While he was photographing, one fish bit the index finger of his left hand, which was on the camera housing. Two months later, the scar was still very evident. Lobel suggests that the lack of food on the artificial reef emboldened the fish to bite his finger as a possible source of food. This was definitely not an example of an attack by a female triggerfish guarding a nest of eggs.

Case report 7

During the summer of 1951, the senior author collected fishes at Onotoa Atoll, Kiribati (Gilbert Islands), primarily with the use of the ichthyocide rotenone. As he was picking up fishes killed by the rotenone at one station, he encountered a triggerfish of the species *Balistoides undulatus* (the Orange-striped Triggerfish) about 25 cm long lying on its side on the bottom, apparently dead. However, the moment it was touched, it bit the senior



Fig. 4. Gray Triggerfish (*Balistes capricus*), Florida (photo by P. Lobel).



Fig. 5. Orange-striped Triggerfish (*Balistoides undulatus*), Maldives Islands (photo by J. Randall).

author on ulnar side of the palm of his right hand with incredible force and would not release. Having seen Gilbertese fishermen dispatch fish they had just caught by biting them on the top of the head, he did the same, which caused the fish to release its grip. The injured region of the hand was badly contused and bore tooth marks, but no tissue had been removed. The wound healed without complications. This incident must be considered a provoked attack. Nevertheless, *Balistoides undulatus* should be regarded as capable of biting humans by mistaking fingers or ears as an item of food. In marine preserves, especially where fishes are fed by humans, many species may approach divers closely. In November 1988, in the Maldive Islands, one particular individual of *Balistoides undulatus* (Fig. 5) became such a nuisance that it had to be repeatedly driven away by the senior author because of his fear of being bitten.

Conclusions

The above cases serve to draw attention to certain triggerfishes as a real hazard to divers. These are principally the two large species *Pseudobalistes fuscus* and *Balistoides viridescens* of the Indo-Pacific region. Undoubtedly, more examples of triggerfish bites on humans could be documented if extensive interviews were carried out with experienced divers of tropical and subtropical localities. Although none of the injuries sustained in the above cases were severe, the potential for serious trauma, such as the loss of a finger, exists. Divers should be especially alert to avoid swimming toward large individuals of *Pseudobalistes fuscus* and *Balistoides viridescens* which do not move away when approached, as they could be females guarding a nest. Care should also be taken to avoid feeding any species of triggerfish by hand.

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